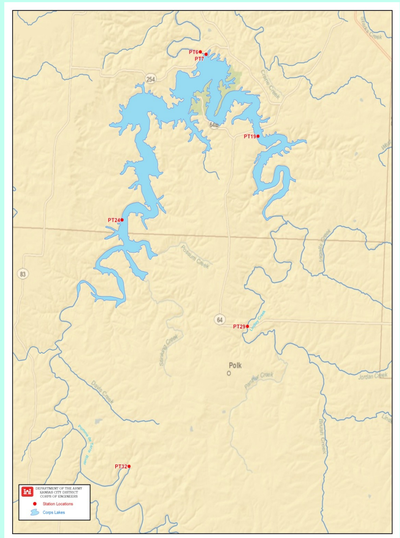
Pomme de Terre Lake Water Quality Summary
2005-2014

Pomme de Terre Lake

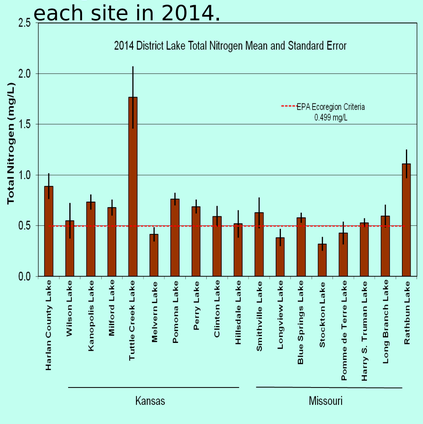
- Built on Pomme de Terre River reaching multipurpose pool in 1960.
- **Watershed**=611 square miles; 391,040 Surface Acres (SA)
- **Capacity:**
  - Flood Control: 406,821 Acre-feet (AF); 15,999 SA
  - Multipurpose: 237,356 AF; 7,790 SA; 113 miles of shoreline
  - Avg. annual inflow (2005-2014)= 434,827 AF; 2014 inflow= 149,904 AF
  - **Operating project purposes**: flood control, water quality, recreation, fish and wildlife
  - **Water Quality** at Pomme de Terre Lake in 2014 was generally suitable for designated uses as water exceedances were not observed for most parameters.

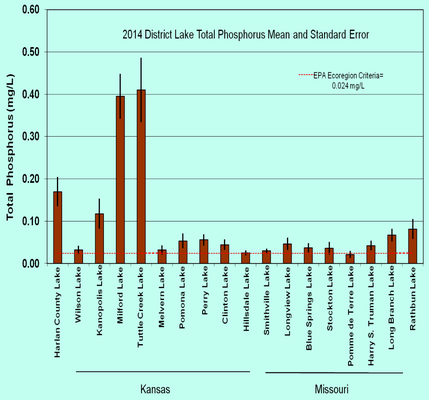


Water quality in Pomme de Terre Lake improves as nutrients, herbicides and sediments are diluted and settled by natural processes as water moves from the inflow streams to the dam.

Nutrient Enrichment

Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging or eutrophication process in lakes. This can alter plant and aquatic life in lakes and water bodies, cause algal blooms, create low dissolved oxygen affecting fish survival, and lead to taste and odor issues in drinking water. In 2014, Pomme de Terre Lake was below the District Lake total phosphorus mean (0.094 mg/L) and District Lake total nitrogen mean (0.68 mg/L) measured at the site nearest the dam. Total phosphorus measured at the dam was below EPA ecoregion recommended criteria (0.024 mg/L) and at the high end or mesotrophic or moderate productivity. Mesotrophic lakes are characterized by moderate levels of nutrients and clear water (i.e. secchi measurement 2-4 meters) which provide good growing conditions for aquatic plants and algae which benefit the aquatic food chain including sportfish. Standard error bars in the graphs below illustrate the variation in nutrient sample results from each site in 2014.



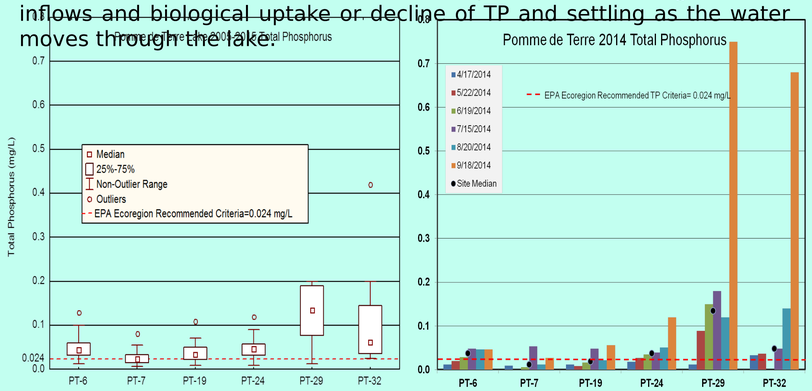


The US Army Corps of Engineers (USACE) Water Quality Program collects monthly water samples at Pomme de Terre Lake* from April through September. These figures present data collected between 2005-2014 from two inflow sites (#29,32), three lake sites (#7,19, 24), and the outflow (#6) below the dam. Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. USACE uses this data to describe conditions and changes from the inflow streams, within the main lake, and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

*Note: The term "lake" is substituted for technically correct "reservoir" throughout this document for consistency.

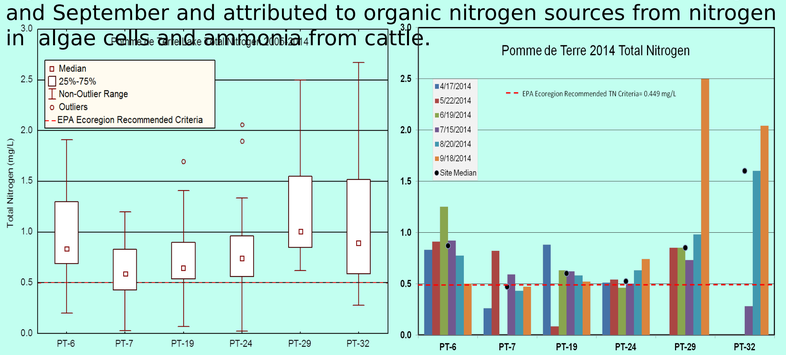
Total Phosphorus

Total phosphorus (TP) median concentrations from 2014 Pomme de Terre Lake samples were above than EPA ecoregion recommended criteria (0.024 mg/L) at lower lake sites except PT-7 at the dam and PT-19. TP values in 2014 were similar to long term trends (2005-2014) except in September. Extreme TP values at both inflows (PT-29 and PT-32) in September were noted and corresponded to peak total suspended solids and total Kehldal nitrogen in both streams. High values for these three analytes may be attributed to cattle in the stream during September sampling. Similar to most impoundments, higher TP concentrations and a wider range of data is usually found in the upper lake sites and inflows due to mobilized nutrients bound to silt particles in moving water in inflows and biological uptake or decline of TP and settling as the water moves through the lake.



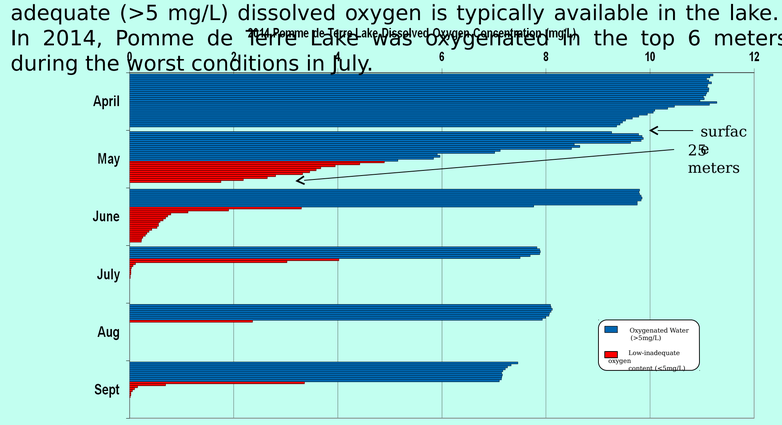
Total Nitrogen

Total nitrogen (TN) is calculated from 3 forms of nitrogen measured from Pomme de Terre Lake. Median TN concentrations on the 3 lake sites are typically near EPA ecoregion criteria (0.499 mg/L). TN concentrations peak in the spring and are highly variable between sites and years related to inflows, biological activity, and upstream land use. A significant peak in TN was observed at inflow sites (#29,32) in August and September and attributed to organic nitrogen sources from nitrogen in algae cells and ammonia from cattle.



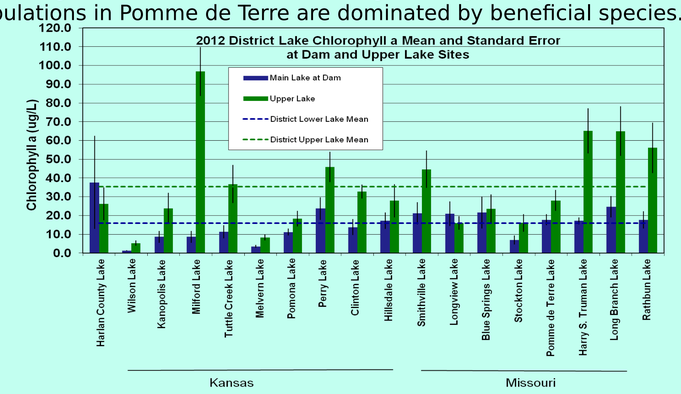
Dissolved Oxygen

Dissolved oxygen (D.O.) is an important factor in aquatic species location, growth, and ultimately survival in lakes. Some lakes undergo a process called stratification or develop layers based on temperature and oxygen. This process begins in late spring, remains throughout the summer, and breaks apart mixing the layers (de-stratifies or 'turns over') in the fall. The figure below illustrates dissolved oxygen measured in the water column in one-meter intervals (e.g. each row in each month represents one meter of depth) from April through September at the dam (PT-7). Pomme de Terre Lake stratifies during the summer, however adequate (>5 mg/L) dissolved oxygen is typically available in the lake. In 2014, Pomme de Terre Lake was oxygenated in the top 6 meters during the worst conditions in July.



Algae

Algae and green plants are the base of the food chain in aquatic food webs and convert nutrients and CO_2 through photosynthesis into biomass for all aquatic life. Chlorophyll a is a measure of the active green pigment present in beneficial algae and harmful blue-green algae (cyanobacteria) active in this process. Chlorophyll a is a critical measurement as it relates nutrients like phosphorus and nitrogen to biological productivity related to algae (good and bad), aquatic invertebrate production, and fish growth. Pomme de Terre Lake typically has high levels (>20ug/L) of chlorophyll a from upper lake sites indicating nutrient enrichment. Blue-green algae is present, but algae populations in Pomme de Terre are dominated by beneficial species.



Water Quality Concerns:

- Nutrients
- Bacteria

US Army Corps of Engineers
Environmental Resources Section
Kansas City, MO